

To: Cindy Osorto[cosorto@blm.gov]; Sally Butts[sbutts@blm.gov]
From: Rebecca Moore
Sent: 2017-05-25T17:49:40-04:00
Importance: Normal
Subject: RE: economic report review and economic snapshots
Received: 2017-05-25T17:49:57-04:00
Appendices to Economic Report RMEdits 5 25 17.docx

Cindy,

Attached is a draft of the Appendices with track changes. I only edited the first appendix. You might take a careful read through the others to be sure they are consistent with the messaging in the report.

(b) (5) - DPP

[REDACTED]. There are a few spots where it would probably help to get Egan's input, and it's probably a really good idea to ask him to read this appendix again to make sure all the details are correct. I'm sure he's happy to help but I'll leave that up to you.

Let me know if you have any questions about the edits.

-Rebecca

From: Osorto, Cindy [mailto:cosorto@blm.gov]
Sent: Thursday, May 25, 2017 9:50 AM
To: Sally Butts <sbutts@blm.gov>
Cc: Rebecca Moore <rmoore@blm.gov>
Subject: Re: economic report review and economic snapshots

Hi Rebecca,

I can take the first stab and should be able to reply by Friday or Monday.

Please let Lynne Koontz to cc me in the email with her reply.

Best,
Cindy

On Thu, May 25, 2017 at 11:43 AM, Sally Butts <sbutts@blm.gov> wrote:
Thanks Rebecca for coordinating the peer review. Cindy can start addressing the comments and then we can check in with you later next week.

Have a nice long weekend.

Sally

Sent from my iPhone

On May 25, 2017, at 11:18 AM, Rebecca Moore <rmoore@blm.gov> wrote:

FYI – Attached is a draft with comments from Ben Simon, DOI. I expect comments

from Lynne Koontz this week, or maybe Tuesday. I will be on leave on Tuesday and Wed next week. Cindy, do you want to take the first stab at addressing these comments, or do you want me to?

Note - I compressed pix in this version so it would email. Make sure we reconcile into a draft with uncompressed pix.

-Rebecca

From: Sally Butts [mailto:sbutts@blm.gov]
Sent: Monday, May 22, 2017 5:43 PM
To: Osorto, Cindy <cosorto@blm.gov>
Cc: Rebecca Moore <rmoore@blm.gov>
Subject: Re: economic report review and economic snapshots

Cindy,

I should have mentioned when we spoke earlier today that Rebecca said she'd update the appendix she thinks needs updating.

Sally

Sent from my iPhone

On May 22, 2017, at 6:01 PM, Osorto, Cindy <cosorto@blm.gov> wrote:

Hi Rebecca,

I've been assigned to lead the formatting effort for the report. Could you please forward me and Sally any future versions with track changes turned on?

Regarding your notes: I didn't find "NCL" upon initial search but I'll keep an eye out for that. I'll also double check the numbers in the figures and tables, update the TOC, and the page number in the cover page. The appendices haven't been updated by me or anyone else since Egan left. Please let me know if you have any other questions and I'm glad to help keep moving this forward.

Regards,
Cindy

On Mon, May 22, 2017 at 11:39 AM, Butts, Sally
<sbutts@blm.gov> wrote:

----- Forwarded message -----

From: **Rebecca Moore** <rmoore@blm.gov>
Date: Wed, May 17, 2017 at 11:10 PM
Subject: RE: economic report review and economic snapshots

To: Sally Butts <sbutts@blm.gov>

Hi Sally,

<https://drive.google.com/open?id=0B8akMDfZmooQZU5NVTA1OGkydVk>

I'm really sorry this is taking much longer than expected. A revised draft is on Google Drive at the link above. It includes fairly thorough editing and reorganizing. I'm still not satisfied with the results section addressing values, but it probably makes the most sense to just leave it and proceed with the following:

1. Peer review. I suggest we send this to Ben Simon (chief economist DOI Office of Policy Analysis) and Lynne Koontz (economist NPS), asking if they or one of their colleagues will review specifically for:

- ☐ Fatal flaws in the analytical approach to estimating contributions
- ☐ Additional information needed to transparently describe the methodology
- ☐ Any comments/concerns regarding the clarity and accuracy of how the basic concepts of contributions and values are presented and related to each other.

I would normally ask for a 2 week turnaround, but we could say quicker is preferred. They'd probably understand. I work closely with both Ben and Lynne and I'm happy to contact them if you like.

2. Copy edit/layout. There are a number of formatting things to check. The layout is kind of confusing with all of the boxes. About half way through I realized that Egan probably spelled out National Conservation Lands every time on purpose, so my use of NCL should be corrected. I think I updated all the Table and Figure numbers, but this should be double checked. The page numbers in the TOC need updating. I couldn't change the date on the front cover, etc. Not sure what the plan is for publishing, so let me know if you'd like me to clean this stuff up.

Last thing – have the Appendices been updated since February? The version I have still refers to using both the NPS and the USFS expenditure profiles, which we don't do.

Again, sorry it took so long. Let me know if you want me to contact Ben and Lynne.

-Rebecca

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Rebecca Moore, PhD  
Senior Economist  
Bureau of Land Management (Decision Support, Planning, and NEPA, WO 210)

Phone: 970 226 9246; Cell: 202 641 5851; Email: [RMoore@blm.gov](mailto:RMoore@blm.gov)  
Mail: Fort Collins Science Center, 2150 Centre Ave., Bldg C., Fort Collins, CO 80526 8118

**From:** Butts, Sally [mailto:[sbutts@blm.gov](mailto:sbutts@blm.gov)]  
**Sent:** Wednesday, May 17, 2017 9:09 AM  
**To:** Rebecca Moore <[rmoore@blm.gov](mailto:rmoore@blm.gov)>  
**Subject:** Re: economic report review and economic snapshots

Hi Rebecca,

I just left a detailed voice message for you inquiring about the status of your review and that of the peer reviewers. We're getting a lot of internal (and external) data requests and assignments that are calling for economic information about our national monuments, including the recent Executive Order on the Review of Designations under the Antiquities Act. Chris and I are really anxious to get the full report released so that it serves to explain the statistics we're including in these data requests and assignments.

Thanks so much for your help and please let me know if there's anything I can do to help.

Sally

On Thu, Apr 27, 2017 at 11:35 AM, Rebecca Moore  
<[rmoore@blm.gov](mailto:rmoore@blm.gov)> wrote:

Sally,  
Just wanted to let you know that I'm running behind on this. I'll be able to get you a revised draft by Monday for sure.  
-Rebecca

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**From:** Sally Butts [mailto:[sbutts@blm.gov](mailto:sbutts@blm.gov)]  
**Sent:** Friday, April 21, 2017 12:16 PM  
**To:** Rebecca Moore <[rmoore@blm.gov](mailto:rmoore@blm.gov)>  
**Subject:** Re: economic report review and economic snapshots

Great, thanks for the reply and for your assistance!

Have a nice weekend. Sally  
Sent from my iPhone  
On Apr 21, 2017, at 1:23 PM, Rebecca Moore  
<[rmoore@blm.gov](mailto:rmoore@blm.gov)> wrote:

Hi Sally,  
I should be able to get you revisions by mid next week. I'll take a look at visitation data and think about how we might add it in.  
-Rebecca

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**From:** Sally Butts [mailto:[sbutts@blm.gov](mailto:sbutts@blm.gov)]

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**Sent:** Thursday, April 20, 2017 8:53 AM

**To:** Rebecca Moore <[rmoore@blm.gov](mailto:rmoore@blm.gov)>

**Subject:** Fwd: economic report review and economic snapshots

Hi Rebecca,

Just checking in on the status of your review of the Economics report following our briefing with leadership earlier this month.

Also, Chris is interested to add in some additional content on visitor data which seems like a good idea. Egan prepared the attached spreadsheet which has snapshots of each unit's data including visitors. I think it would be great to eventually post the snapshots to our website along with the report and key statistics. I'm interested in your thoughts about how to incorporate a little bit more in the report itself on visitor data to show how much visitation is occurring at the monuments and NCAs.

Also, did you see Secretary Zinke's news release yesterday? This is great support for our Economics report. I copied the link to the release below.

<https://www.doi.gov/pressreleases/secretary-zinke-announces-349-billion-added-us-economy-2016-due-national-park>

Thanks so much for your help and let me know if you need anything.

Next step after your review is to go to the two peer reviewers you mentioned, one is with USFS as I recall.

Sally

Sent from my iPhone  
Begin forwarded message:

**From:** "Butts, Sally" <[sbutts@blm.gov](mailto:sbutts@blm.gov)>

**Date:** April 20, 2017 at 10:35:01 AM EDT

**To:** Sally Butts <[sbutts@blm.gov](mailto:sbutts@blm.gov)>

**Subject:** economic snapshots

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17 PPA comments.docx>

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## Appendices to Economic Report: National Conservation Lands

February 6, 2017

Egan Cornachione, GeoCorps Intern with National Conservation Lands

### Appendix A: Methodology for Estimating Visitor Spending Effects on National Conservation Lands

Economic contribution analysis of the National Conservation Lands visitors requires several different types of data. The four main types of information required are: number of visitors, visitor characteristics, spending patterns of visitors, and regional economic multipliers. Units report annual visitation estimates and activity participation to the BLM's Recreation Management Information System (RMIS). Regional economic multipliers were generated for this project using the IMPLAN software and data system (IMPLAN Group LLC). Although the Bureau of Land Management conducted two pilot projects of a visitor use monitoring program in 2006 and 2009, there are very little data available on visitor characteristics and spending patterns of visitors (White nd).

For this report, estimates of visitor spending are based on comparable data from the NPS Visitor Services Project (VSP) associated with NPS sites located with or near NCL units. While National Forests were also considered as potential sites to match with National Conservation Lands, the generic and park specific profiles for National Parks visitors developed by Thomas and Koontz (2016) are considered to better represent visitors to the National Conservation Lands. National Monuments and NCAs are among the most popular BLM recreation sites: 21 sites reported over 100,000 visits in 2016.

A selection process was used to determine the most closely compatible National Park Service unit on which to base visitor characteristic and spending data for a BLM unit.

1. **Data:** The number of visitors to each unit  
**Source:** BLM's Recreation Management Information System (RMIS)  
**Assumption:** *Visitor data accurately reflects actual number of visitors to each unit.* There are many different forms of tracking visitor use of a monument or NCA. Some units, such as Jupiter Inlet Lighthouse ONA, have a visitor center through which visitors pay a fee to enter the unit, which lends itself to a relatively straightforward counting process. Others have many access points and no fee stations. In these cases, a variety of methods is used to count visitation including traffic counters, fee slips, and the judgement of managers. The 2006 pilot implementation of the USFS NVUM program found that in two of three cases, RMIS visitation estimates were significantly higher than what was found in the survey, while in the third case, RMIS produced a significant underestimation of visitation when compared with the NVUM survey. Because of this limitation, results are reported both in terms of total economic contributions as well as per visit economic contributions. Assuming visitor characteristics remain relatively constant, per visit contributions provide the most accurate way of estimating total contributions.



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2. **Data:** Visitor characteristics. This includes the distribution of types of visitors to each unit, into categories of *local* and *non local*, *day* and *overnight*, *camping in the unit* or *staying outside the unit*. Within each of these categories, data on the party size, number of days spent at the unit, and re entry rates were also used.

**Source:** National Park Service Visitor Services Project surveys (2003 2015)

**Assumption:** *The characteristics of BLM National Monument and NCA visitors are comparable to those of NPS visitors.* The spending patterns of different types of visitors are widely varied, so it is important to be able to break visitors into categories to account for these differences. White et al (2013) note that visitor trip type segments explain a large portion of the total variation in trip expenditures. This means that the accuracy of these estimates is linked directly to the accuracy of economic contribution estimates. The most crucial component is the percentage of local vs. non local visits. National Park Service units may average higher non local visitation than BLM monuments and NCAs. This difference is not reflected in this analysis. Local day visitors tend to spend money mostly on gas and oil, while non local overnight visitors have the greatest expenditures on lodging and restaurants (White et al 2013).

Spatial relationships were used to select the most comparable NPS unit to use for the analysis. For NPS units, a buffer analysis was run in ArcMap 10.2 using spatial data from the National Conservation Lands and the National Park Service to select NPS units within 25, 50, and 125 miles of the National Conservation Lands site. In cases where multiple NPS sites were matched, factors of access, recreation types and unit resources were considered when selecting the most comparable site. Since not all NPS sites have been surveyed for visitor characteristics, several generic profiles have been developed to apply to non surveyed sites. In these cases, the generic profile for the NPS site that was matched with BLM site was applied.

3. **Data:** The spending patterns of visitors on their trips, broken down into *hotel*, *camping*, *restaurants*, *groceries*, *gas and oil*, *fees*, *entertainment*, *sporting goods*, and *souvenirs*.

**Source:** National Park Service Visitor Services Project (VSP) (2003 2015)

**Assumption:** *The spending patterns of BLM visitors is similar to that of NPS visitors.* Spending is estimated from visitor surveys for each trip type in a number of different economic sectors, within 50 miles of the unit. Spending generally includes only specific trip related expenditures. Purchases of durable goods and other major one time expenditures typically are not included in these estimations. In other words, if a survey respondent had reported \$1000 in sporting goods expenditures on their trip, this observation was not included in the calculation of trip related expenditures since the purchase is likely related to a generic interest unrelated to that particular visit.

Spending estimates in each trip type segment do not vary considerably between the NPS VSP profiles and the USFS NVUM data that were also considered. The primary major differences in total spending at units arise from the distribution of trip type segments. The majority (65%) of USFS visits fall into low spending categories such as local and non primary, while the majority (69%) of NPS visits in the highest spending profile fell into the non local day and overnight lodging categories. These visitation differences result in greater total expenditures and greater overall economic

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contributions when using NPS comparisons than USFS comparisons. (b) (5) - DPP

4.

**Data:** Regional economic multipliers

**Source:** IMPLAN Group LLC. (economic data compiled from US Census, Bureau of Economic Analysis, and Bureau of Labor Statistics)

**Assumption:** *The state level economic multipliers from IMPLAN will effectively capture the linkages between BLM trip spending sectors and other economic sectors.* IMPLAN models the flow of goods and services between all sectors in an economy. In this analysis, the state that contains the monument or NCA is the economy that is modeled for each unit. As a result, states that have a greater number of economic sectors will generally experience a greater flow of spending within the state before dollars "leak" out of the economy. Local economic contributions would generally be smaller compared to state level contributions, while at a national level they would be greater due to the greater number of economic linkages in a larger region. Using the state level model, however, masks a certain amount of variation in local multipliers. For example, if a local economy is largely service based, the multiplier for spending in service sectors could be higher in the local region than for the total state economy. Since spending is divided among eight sectors, it is presumed that any effects related to these discrepancies may be relatively small.

These four components of visitor information are variables that, taken together, are used to give an estimate of visitor spending impact. Following is a step by step example of how visitor spending was estimated at Gunnison Gorge National Conservation Area. This process was replicated for all 46 Monuments and NCAs.

**Step 1. Number of Visits.** An estimated 206,036 visits to the unit took place in 2015 (BLM RMIS)

**Step 2. Visit Segments.** The NPS divides overnight visits into camping on and off site and offsite lodging.

Commented [MRL1]: (b) (5) - DPP

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The Grand Mesa Uncompahgre Gunnison National Forest unit is the closest comparable unit that has been surveyed. The latest USFS NVUM summary (2006 2010) showed that visitors to the Grand Mesa Uncompahgre Gunnison National Forests had the following distribution of trip types:</p> <ul style="list-style-type: none"> <li>a) Local Day: 53%</li> <li>b) Local Overnight onsite: 3%</li> <li>c) Local Overnight offsite: 2%</li> <li>d) Non Local Day: 7%</li> <li>e) Non Local Overnight onsite: 7%</li> <li>f) Non Local Overnight offsite: 17%</li> <li>g) Non Primary: 10%</li> </ul> | <p>Black Canyon of the Gunnison National Park is connected to Gunnison Gorge NCA and was chosen over Colorado NM and Curecanti NRA as the most suitable unit comparison. It has not been surveyed and fell into the "Camp Only" generic NPS profile with the following distribution of trip types:</p> <ul style="list-style-type: none"> <li>a) Local Day: 6%</li> <li>b) Non Local Day: 34.9%</li> <li>c) Camp Onsite: 5.7%</li> <li>d) Lodge Offsite: 33.9%</li> <li>e) Camp Offsite: 5.3%</li> <li>f) Non Primary: 14.3%</li> </ul> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Commented [MRL2]: (b) (5) - DPP

**Step 3. Visit Distributions.** Multiplying the 206,036 visitors by the types of visit gives the following distribution of visitors to Gunnison Gorge NCA:

| USFS Comparison                                                                                                                                                                                                                                                                                                               | NPS Comparison                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>a) Local Day: 109,199</li> <li>b) Local Overnight onsite: 6,181</li> <li>c) Local Overnight offsite: 4,121</li> <li>d) Non Local Day: 14,423</li> <li>e) Non Local Overnight onsite: 14,423</li> <li>f) Non Local Overnight offsite: 35,026</li> <li>g) Non Primary: 20,604</li> </ul> | <ul style="list-style-type: none"> <li>a) Local Day: 12,362</li> <li>b) Non Local Day: 71,906</li> <li>c) Camp Onsite: 11,744</li> <li>d) Lodge Offsite: 69,846</li> <li>e) Camp Offsite: 10,920</li> <li>f) Non Primary: 29,463</li> </ul> |

**Step 4. Party Size, Length of Stay and Re Entry Rate.** NPS profiles are generated per party per day/night. This requires party visits to be multiplied by length of stay divided by re entry rate (to avoid double counting of visits).

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| USFS Comparison                                                                                                                                                                                                                           | NPS Comparison                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Party Size:</b><br>a) Local Day: 2.3<br>b) Local Overnight onsite: 1.9<br>c) Local Overnight offsite: 2.4<br>d) Non Local Day: 2.4<br>e) Non Local Overnight onsite: 2.6<br>f) Non Local Overnight offsite: 2.4<br>g) Non Primary: 2.8 | <b>Party Size:</b><br>a) Local Day: 2.7<br>b) Non Local Day: 2.9<br>c) Camp Onsite: 2.9<br>d) Lodge Offsite: 2.8<br>e) Camp Offsite: 3.0<br>f) Non Primary: 2.9<br><b>Length of Stay:</b><br>a) Local Day: 1<br>b) Non Local Day: 1<br>c) Camp Onsite: 2.3<br>d) Lodge Offsite: 2.0<br>e) Camp Offsite: 2.3<br>f) Non Primary: 2.6<br><b>Re Entry Rate:</b><br>a) Local Day: 1<br>b) Non Local Day: 1<br>c) Camp Onsite: 1.6<br>d) Lodge Offsite: 1.4<br>e) Camp Offsite: 1.3<br>f) Non Primary: 1.3 |

**Step 5. Party Visits and Party Day/Nights.** Visits for each segment from step 3 are converted into party day/nights

| USFS Comparison                                                                                                                                                                                                                                             | NPS Comparison                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Party Visits:</b><br>a) Local Day: 47,478<br>b) Local Overnight onsite: 3,253<br>c) Local Overnight offsite: 1,717<br>d) Non Local Day: 6,010<br>e) Non Local Overnight onsite: 5,547<br>f) Non Local Overnight offsite: 14,594<br>g) Non Primary: 7,359 | <b>Party Day/Nights:</b><br>a) Local Day: 4,579<br>b) Non Local Day: 24,795<br>c) Camp Onsite: 5,821<br>d) Lodge Offsite: 35,636<br>e) Camp Offsite: 6,440<br>f) Non Primary: 20,319 |

**Step 6. Spending Profiles.**

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Spending profiles based on National Park Service VSP data are arranged by trip type: local and non local day, onsite and offsite camping, offsite lodging, and non primary. Non primary visits have only slightly lower spending than local visits in the NPS spending profile. The NPS profiles also show spending per party per day/night. In other words, if a party spends three days on the unit, then the per party per day/night spending amount is applied three times. This is why party visits are converted to party day/nights in Step 5.

| NPS Spending Profile for "Camp Only" Site Visits (In \$2015 per day/night) |           |         |         |           |          |         |
|----------------------------------------------------------------------------|-----------|---------|---------|-----------|----------|---------|
|                                                                            | Local Day | NL Day  | Camp In | Lodge Out | Camp Out | Other   |
| <i>Motel</i>                                                               | \$0.00    | \$0.00  | \$0.00  | \$109.76  | \$0.00   | \$0.00  |
| <i>Camping</i>                                                             | \$0.00    | \$0.00  | \$10.74 | \$1.13    | \$28.93  | \$0.00  |
| <i>Restaurants</i>                                                         | \$6.30    | \$12.34 | \$7.57  | \$46.73   | \$13.47  | \$6.24  |
| <i>Groceries</i>                                                           | \$5.84    | \$5.60  | \$10.59 | \$11.16   | \$12.73  | \$5.64  |
| <i>Gas and Oil</i>                                                         | \$9.89    | \$16.54 | \$15.40 | \$24.86   | \$32.19  | \$8.80  |
| <i>Transportation</i>                                                      | \$0.97    | \$3.34  | \$3.82  | \$13.72   | \$4.30   | \$2.74  |
| <i>Admission and Fees</i>                                                  | \$5.15    | \$9.47  | \$4.90  | \$13.30   | \$10.26  | \$3.41  |
| <i>Souvenirs and Other</i>                                                 | \$5.04    | \$11.99 | \$9.57  | \$17.29   | \$13.23  | \$5.86  |
| <i>Total</i>                                                               | \$33.19   | \$59.28 | \$62.59 | \$237.95  | \$115.11 | \$32.69 |

Step 7. *Total Spending Calculation.* Finally, the party visits from step 5 are multiplied by each spending item from step 6 to give total spending.

Using the NPS VSP Profile:

| Visitor Spending by Visit Type and Sector, Gunnison Gorge NCA in 2016 (\$2015) |           |             |           |             |           |           |              |
|--------------------------------------------------------------------------------|-----------|-------------|-----------|-------------|-----------|-----------|--------------|
|                                                                                | Local Day | NL Day      | Camp In   | Lodge Out   | Camp Out  | Other     | Total        |
| <i>Motel</i>                                                                   | \$0       | \$0         | \$0       | \$4,037,746 | \$0       | \$0       | \$4,037,746  |
| <i>Camping</i>                                                                 | \$0       | \$0         | \$64,537  | \$41,569    | \$192,327 | \$0       | \$298,433    |
| <i>Restaurants</i>                                                             | \$29,779  | \$315,853   | \$45,488  | \$1,719,059 | \$89,549  | \$130,886 | \$2,330,614  |
| <i>Groceries</i>                                                               | \$27,605  | \$143,337   | \$63,636  | \$410,543   | \$84,629  | \$118,301 | \$848,051    |
| <i>Gas and Oil</i>                                                             | \$46,749  | \$423,356   | \$92,539  | \$914,526   | \$214,000 | \$184,583 | \$1,875,752  |
| <i>Transportation</i>                                                          | \$4,585   | \$85,490    | \$22,954  | \$504,718   | \$28,586  | \$57,472  | \$703,807    |
| <i>Admission and Fees</i>                                                      | \$24,344  | \$242,393   | \$29,444  | \$489,268   | \$68,209  | \$71,526  | \$925,183    |
| <i>Souvenirs and Other</i>                                                     | \$23,824  | \$306,895   | \$57,506  | \$636,048   | \$87,953  | \$122,915 | \$1,235,141  |
| <i>Total</i>                                                                   | \$156,886 | \$1,517,324 | \$376,104 | \$8,753,477 | \$765,253 | \$685,683 | \$12,254,726 |

Step 8. *Applying regional economic multipliers.*

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Using IMPLAN software, economic multipliers for the state of Colorado were generated for each visit to Gunnison Gorge NCA, based on a per visit spending profile derived by dividing total spending from Step 7 by number of visits to the NCA.

| Economic Multipliers from the Grand Mesa Uncompaghre Gunnison National Forest NVUM Profiles |            |              |             |           |  |
|---------------------------------------------------------------------------------------------|------------|--------------|-------------|-----------|--|
| per visit (in \$2015, source: IMPLAN Group LLC)                                             |            |              |             |           |  |
| Impact Type                                                                                 | Employment | Labor Income | Value Added | Output    |  |
| Direct Effect                                                                               | 0.0005468  | \$15.4317    | \$23.3188   | \$38.8891 |  |
| Indirect Effect                                                                             | 0.0001049  | \$5.5844     | \$9.4906    | \$17.0429 |  |
| Induced Effect                                                                              | 0.0001316  | \$6.0885     | \$10.7673   | \$18.7224 |  |
| Total Effect                                                                                | 0.0007834  | \$27.1046    | \$43.5767   | \$74.6544 |  |

Commented [MRL3]: (b) (5) - DPP

Finally, multiplying the visit statistics through each category of spending effects produces the following table of economic contributions:

| Economic Multipliers from the Grand Mesa Uncompaghre Gunnison National Forest NVUM Profiles |            |              |             |              |  |
|---------------------------------------------------------------------------------------------|------------|--------------|-------------|--------------|--|
| Total                                                                                       |            |              |             |              |  |
| Impact Type                                                                                 | Employment | Labor Income | Value Added | Output       |  |
| Direct Effect                                                                               | 113        | \$3,179,487  | \$4,804,515 | \$8,012,546  |  |
| Indirect Effect                                                                             | 22         | \$1,150,594  | \$1,955,405 | \$3,511,455  |  |
| Induced Effect                                                                              | 27         | \$1,254,450  | \$2,218,450 | \$3,857,488  |  |
| Total Effect                                                                                | 161        | \$5,584,530  | \$8,978,371 | \$15,381,489 |  |

## Appendix B: Methodology for using Benefit Transfer for Nonmarket Recreation Values

### B.1: Valuing Recreation Experiences

Visitors to BLM sites often pay little or no fee, yet the experience they are consuming is, in theory, worth the same or greater than the amount they paid. The resulting difference between one's "willingness to pay" and the amount they actually pay is called consumer surplus. For example, if 100 visitors to a particular unit were each individually willing to pay \$25 for their experience, and each only had to pay a \$5 use fee, then a consumer surplus of \$20 per person (\$25 minus \$5), or \$2,000 total, will be generated by the visits. If for some reason the site were closed down and those visitors were not able to recreate, the unit would lose \$500 of fee revenue, and \$2,000 of economic value would be lost by consumers due to the closing of the unit. In OMB Circular A 94, *Guidelines and Discount Rates for Benefit Cost Analysis of Federal Programs*, the memo states that "when it can be measured, consumer surplus provides the best measure of the total benefit to society from a government program or project" (OMB 1992, 6.b.1).

Consumer surplus depends upon visitors' willingness to pay for their recreation experience. Since little or no money is exchanged for BLM recreation experiences, consumers' willingness to pay must be measured using a form of nonmarket valuation, the concept introduced in Section 2.3. Two of the primary forms of nonmarket valuation techniques related to recreation are called contingent valuation and travel cost methods. The contingent valuation method utilizes surveys given to consumers which ask a series of questions to determine how much an individual would be willing to pay for the good or service in question. The travel cost method looks at how much money people spend making trips to recreation sites, how many trips they take, and what they give up to take those trips in order to derive a "demand curve" for recreation visitors. The curve represents consumers' willingness to pay for their recreation experiences.

Generally, primary studies for estimating willingness to pay for recreation experiences can be time consuming and/or costly. Thus, one approach for estimating willingness to pay for different types of recreation experiences is by using a benefit transfer. The benefit transfer approach involves choosing previous studies conducted in similar areas to the site in question that have estimated willingness to pay and applying the benefits for similar experiences on the study site.

#### **B.2: The Benefit Transfer Approach to Valuing Recreation Experiences**

The USGS, with support from Colorado State University's Department of Agriculture and Resource Economics and Oregon State University's College of Forestry, developed a toolkit for estimating recreation consumer surplus. The resource is called the "benefit transfer toolkit" and is publicly accessible at [my.usgs.gov/benefit-transfer/](http://my.usgs.gov/benefit-transfer/). It consists of a database of over 463 research studies that have utilized either the travel cost or contingent valuation model to estimate consumer surplus values for 13 forms of recreation activities in areas across the US. The database provides a total of 2900 individual recreation consumer surplus values, sortable by type of recreation, valuation method, location, and year. For each study listed, the database provides a per person, per day consumer surplus value for each type of recreation studied. For example, a study by Loomis et al (2005) used a travel cost model to estimate the benefits of general recreation in Steese National Conservation Area, Alaska. The study determined that the consumer surplus was \$61.75 per person per day for *all* types of recreation in this particular area. So, for example, if 10,000 people visit the site in a year, then the total consumer surplus for general recreation opportunities at Steese is \$617,500. This is not money that is exchanged, rather it represents the economic value of the recreational opportunities made available by the National Conservation Lands at Steese NCA.

Since original studies such as these are expensive and require the expertise of a trained economist, the use of a benefit transfer is one way to obtain economic values for sites that have not been studied (BLM IM 2013 131). This is where the recreation consumer surplus values from one site are transferred to a separate site with very similar characteristics to value a very similar recreational experience. So, if one wanted to estimate the economic value of general recreation at, say, White Mountains National Recreation Area (a nearby area in the eastern interior of Alaska), a benefit transfer could be used. The \$61.75 per person per day figure would be multiplied by the number of visitors to White Mountains to obtain the total consumer surplus at that site, with the assumption that the value placed by visitors on the recreational opportunities at each are roughly similar.

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In many cases a suitable comparison study is not available, so the next best approach is to use an average value transfer (BLM IM 2013 131). In an average value transfer, a number of similar sites are chosen to apply a value transfer. The average of the per person, per day surplus values is used to estimate the consumer surplus at the study site. The average value transfer method is used for consumer surplus calculations in the Grand Canyon Parashant National Monument case study. To create a generic tool for estimating economic value for recreation on National Conservation Lands, an average of all studies that valued each type of recreation in a particular state was used for a benefit transfer. Huber and Richardson (2016) provide further examples of how the benefit transfer method can be applied at various BLM sites and offices.

**Appendix C: Tables to Aid in Identifying, Quantifying and Monetizing Economic Values  
Associated with National Monuments and NCAs**

Table C1: Resources, Objects and Values of National Monuments and NCAs

| Name                                  | Recreational<br>Values | Educational Values | Cultural Values | Paleontological/<br>Geological Values | Scientific Values | Riparian/Water<br>Values | Wildlife/Wildlife<br>Habitat Values | Vegetation/<br>Ecological Values |
|---------------------------------------|------------------------|--------------------|-----------------|---------------------------------------|-------------------|--------------------------|-------------------------------------|----------------------------------|
| Steese                                |                        |                    | x               |                                       | x                 | x                        | x                                   |                                  |
| Gila Box Riparian                     | x                      | x                  | x               | x                                     | x                 | x                        | x                                   |                                  |
| Las Cienegas                          | x                      | x                  | x               | x                                     | x                 | x                        | x                                   | x                                |
| San Pedro Riparian                    | x                      | x                  | x               | x                                     | x                 | x                        | x                                   |                                  |
| Fort Ord                              | x                      | x                  | x               |                                       | x                 | x                        | x                                   | x                                |
| King Range                            | x                      |                    |                 | x                                     |                   | x                        | x                                   | x                                |
| Dominguez Escalante                   | x                      | x                  | x               | x                                     | x                 | x                        | x                                   |                                  |
| Gunnison Gorge                        | x                      | x                  | x               | x                                     | x                 |                          | x                                   | x                                |
| McInnis Canyons                       | x                      | x                  | x               | x                                     | x                 |                          | x                                   |                                  |
| Snake River Birds of Prey             |                        | x                  | x               |                                       | x                 |                          | x                                   |                                  |
| Black Rock Desert High Rock<br>Canyon | x                      | x                  | x               | x                                     | x                 | x                        | x                                   | x                                |
| Red Rock Canyon                       | x                      |                    | x               | x                                     | x                 | x                        | x                                   | x                                |
| Sloan Canyon                          |                        | x                  | x               | x                                     | x                 |                          | x                                   |                                  |
| El Malpais                            |                        |                    | x               | x                                     | x                 |                          |                                     | x                                |
| Fort Stanton Snowy River<br>Cave      |                        | x                  | x               |                                       | x                 |                          |                                     |                                  |
| Beaver Dam Wash                       | x                      | x                  | x               |                                       | x                 |                          | x                                   | x                                |
| Red Cliffs                            | x                      | x                  | x               |                                       | x                 |                          | x                                   | x                                |
| Yaquina Head                          | x                      | x                  | x               |                                       | x                 |                          | x                                   |                                  |
| Steens Mountain                       | x                      |                    | x               | x                                     |                   | x                        | x                                   | x                                |
| Headwaters                            | x                      |                    |                 |                                       | x                 |                          | x                                   | x                                |
| Piedras Blancas                       | x                      | x                  | x               |                                       | x                 |                          | x                                   |                                  |
| Jupiter Inlet                         | x                      | x                  | x               |                                       | x                 | x                        |                                     | x                                |



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|                                  |           |           |           |           |           |           |           |           |
|----------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Agua Fria                        |           |           | x         |           |           | x         | x         | x         |
| Grand Canyon Parashant           |           |           | x         | x         | x         | x         | x         | x         |
| Ironwood Forest                  |           |           | x         | x         | x         |           | x         | x         |
| Sonoran Desert                   |           |           | x         | x         | x         | x         | x         | x         |
| Vermilion Cliffs                 |           |           | x         | x         | x         | x         | x         | x         |
| California Coastal               |           |           |           | x         | x         |           | x         | x         |
| Carrizo Plain                    |           |           | x         | x         | x         | x         | x         | x         |
| Santa Rosa San Jacinto Mountains | x         | x         | x         | x         | x         |           | x         |           |
| Canyons of the Ancients          |           |           | x         | x         | x         |           | x         | x         |
| Craters of the Moon              |           |           | x         | x         | x         | x         | x         | x         |
| Pompeys Pillar                   |           |           | x         | x         |           |           |           |           |
| Upper Missouri River Breaks      |           |           | x         | x         |           | x         | x         | x         |
| Kasha Katuwe Tent Rocks          |           |           | x         | x         | x         |           | x         | x         |
| Prehistoric Trackways            | x         | x         |           | x         | x         |           |           |           |
| Cascade Siskiyou                 |           |           | x         | x         |           |           | x         | x         |
| Grand Staircase Escalante        |           |           | x         | x         | x         | x         | x         | x         |
| <b>Totals</b>                    | <b>19</b> | <b>18</b> | <b>34</b> | <b>27</b> | <b>32</b> | <b>19</b> | <b>33</b> | <b>25</b> |

**Table C2: A Resources, Objects, and Values Framework for Economic Analysis of National Monuments and NCAs Identifying Values**

| ROV Category | Direct Use Value                                                                                                                                                                                                | Indirect Use Value                                                                                                                                                                                                                                                                    | Non-Use Value                                                                                                                                                                                                                                                  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recreational | 1. Values ascribed to recreational experiences such as hiking, camping, or OHV use, as described in terms of individuals' willingness to pay for these activities<br>2. Fees collected from recreation visitors | 1. Health and other community benefits due to low cost recreation for community members                                                                                                                                                                                               | 1. Bequest value: conserving recreational opportunities for future generations to experience<br>2. Option value: conserving recreational opportunities for individuals who value the option of being able to visit the unit and who may one day visit the unit |
| Educational  | 1. Value ascribed to field trips, courses, projects, or other educational experiences on the unit                                                                                                               | 1. Value of increased local environmental knowledge, awareness and engagement with BLM which can improve overall efficiency of land use and resource decisions<br>2. Building empathy, knowledge and awareness of land to improve collective environmental consciousness of community | 1. Bequest value: value for future generations to be able to receive similar educational benefits                                                                                                                                                              |

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|                                   |                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                          |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cultural/Historical</b>        | 1. Values ascribed to cultural experiences, as described in terms of individuals' willingness to pay for these activities                                                                                                                                     | 1. Community value of sense of place associated with preservation of cultural heritage                                                                                                                                                                                                                                                                                                                                     | 1. Bequest value: preserving cultural sites for future generations to connect with<br>2. Option value: value for individuals to have the option to visit a cultural site at some point in their lives<br>3. Existence value: value to individuals for whom the site is important but who may never visit |
| <b>Paleontological/Geological</b> | 1. Value of mineral extraction potential<br>2. Value associated with paleontological, archaeological, or geological discoveries<br>3. Spending from conferences, field trips/field camps, and other related events that take place on the unit (Contribution) | 1. Values supported by geologic processes such as:<br>a. Geologic carbon sequestration and storage supporting climate regulation and air quality which generates health and productivity benefits<br>b. Replenishment of aquifers and water retention which supports healthy and lower cost water supply                                                                                                                   | 1. Option value: value for archaeologists or paleontologists to one day study the unit                                                                                                                                                                                                                   |
| <b>Scientific</b>                 | 1. Value associated with using resources on the unit as a living laboratory, as opposed to conducting research or educational experiments in an indoor lab<br>2. Community values associated with science visits and conferences                              | 1. Value of products or services that develop as a result of scientific discoveries on the unit                                                                                                                                                                                                                                                                                                                            | 1. Option value: value of being able to conduct research on the unit in the future<br>2. Bequest value: value for future generations to learn science hands on at the unit                                                                                                                               |
| <b>Water/Riparian</b>             | 1. Value of healthy fisheries and healthy water flow for other water based recreation; visitor spending on these activities<br>2. Value of water or watershed as a freshwater source                                                                          | 1. Riparian zones provide:<br>a. Decreased prevalence of algal blooms<br>b. Increased nutrient retention and increased vegetative diversity and density<br>c. Crop protection from wind and other damage<br>d. Bird and other wildlife densities<br>e. Flooding and natural disaster protection<br>2. These values provide health benefits to community members, improved crop production and enhanced recreational values | 1. Bequest value: value of maintaining healthy water source and water ecosystem for the benefit of future generations                                                                                                                                                                                    |

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|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wildlife/Habitat           | 1. Value ascribed to hunting experiences, value ascribed to wildlife viewing and photography                                                                                                                                                                 | 1. Community values for conserving populations that impact sense of place or community cultural identity, i.e. conserving the habitat for “charismatic megafauna”<br>2. Crop pollination services provided by healthy populations of bats and bees<br>3. Avoided cost of population control and disease prevention required when natural biological processes do not take place | 1. Bequest value: value for future generations to be able to see natural habitats and wildlife<br>2. Option value: value for an individual to be able to see natural habitats and wildlife at some point<br>3. Existence value: value placed on the continued existence of biodiversity not related to visiting the habitat |
| Vegetative                 | 1. Values associated with plant, food, or fibers that can be collected<br>2. Value of timber harvest potential<br>3. Forage values, as measured in AUMs                                                                                                      | 1. Carbon sequestration and storage, supporting climate regulation and air quality, which generates health and productivity benefits<br>2. Erosion prevention and soil health supported by healthy vegetation                                                                                                                                                                   | 1. Bequest value: value for future generations to receive the same benefits                                                                                                                                                                                                                                                 |
| Local Economic Opportunity | 1. Using the monument as an resource to provide recreation based tourism and support jobs<br>2. Value of having job opportunities related to recreation use of the monument and federal management                                                           | 1. Value of a diverse local economy which benefits from BLM jobs and those supported by visitors.                                                                                                                                                                                                                                                                               | 1. Bequest value: value for future generations to have same diverse economic employment opportunities                                                                                                                                                                                                                       |
| Additional Values          | 1. Payments in Lieu of Taxes (PILTs) to compensate counties for losses in property taxes<br>2. Portion of home values associated with viewsheds of National Monument, and portion associated with accessibility to low cost outdoor recreation opportunities | 1. Amenity migration of people seeking quality of life related to scenic views and outdoor recreation opportunities                                                                                                                                                                                                                                                             | 1. Bequest value: value to future generations of having a “National Conservation Lands” system                                                                                                                                                                                                                              |

After values have been identified and described based on Table 3, the techniques from Table 4 can be applied to quantify and/or monetize the most relevant values.

Table C3: Valuation Techniques to Assess the Economic Value of National Monuments and NCAs

| ROV Category | Market Based Valuation Techniques         | Nonmarket Valuation Techniques                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recreational | 1. Total revenue from recreation use fees | 1. Estimating consumer surplus from recreational experiences using the benefit transfer method or an original travel cost or contingent valuation model<br>2. Avoided costs of health and fitness expenditures that are saved to individuals by the provision of low or no cost outdoor recreation<br>3. Hedonic pricing of home values near the unit that are impacted by access to recreational opportunities |

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|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Educational                                 |                                                                                                                                                           | 1. Estimating willingness to pay for environmental education through contingent valuation, or utilizing a benefit transfer of previous contingent valuation studies valuing environmental education or interpretation<br>2. Quantify the number of events, interpretive visits, field trips, or other partnerships and educational activities that take place on the unit                                                                                                                                                |
| Cultural/Historical                         |                                                                                                                                                           | 1. Contingent valuation for protecting cultural sites, and willingness to pay for visits to cultural sites                                                                                                                                                                                                                                                                                                                                                                                                               |
| Paleontological/Geological                  | 1. Using market prices and estimated natural resource abundance to measure the saleable value of mineral resources                                        | 1. Measuring geologic carbon sequestration, applying social cost of carbon to estimate benefits of carbon storage<br>2. Drinking water costs in communities that depend on nearby aquifers or aboveground sources that are protected by protecting geologic formations                                                                                                                                                                                                                                                   |
| Scientific                                  |                                                                                                                                                           | 1. Quantifying research proposals/journal articles taking place in units<br>2. Number of scientific partnerships with universities or institutions and any money paid by universities or institutions                                                                                                                                                                                                                                                                                                                    |
| Water/Riparian                              |                                                                                                                                                           | 1. Decreased costs of providing clean drinking water<br>2. Avoided costs of potential flood damage, algal bloom damage<br>3. Impact of healthy riparian zones on crop values                                                                                                                                                                                                                                                                                                                                             |
| Wildlife/Habitat                            | 1. Prices paid to acquire hunting and fishing licenses and tags for game within units.                                                                    | 1. Valuing the impact of pollinators on nearby crop productivity<br>2. Estimating avoided costs of pest control provided by biodiversity<br>3. Valuing willingness to pay for biodiversity through benefit transfer method or original contingent valuation study<br>4. Valuing willingness to pay for hunting or wildlife based recreational activities<br>5. Quantifying businesses that are tied to wildlife viewing or number of sites where sense of place or other community values depend on a species or habitat |
| Vegetative                                  | 1. Market value of any harvested plant materials<br>2. Market value of current levels of livestock grazing                                                | 1. Benefits of erosion prevention provided by healthy root systems, as measured in improved water quality<br>2. Measuring biomass carbon sequestration, applying social cost of carbon to estimate benefits of carbon storage                                                                                                                                                                                                                                                                                            |
| Additional Value Local Economic Opportunity | 1. Though not a value, measuring economic activity generated through visitor spending can help describe the value to the functioning of the local economy |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Additional Values                           | 1. Calculating PILT amounts based on federal reporting                                                                                                    | 1. Identifying population shifts, demographic shifts or opening and closing of businesses that can signal presence of amenity migrants                                                                                                                                                                                                                                                                                                                                                                                   |

**Table C4: Economic Values at Grand Canyon Parashant National Monument, through the Resources, Objects, and Values of Designation**

| ROV | Description of Value | Direct Use Value | Indirect Use Value | Non Use Value |
|-----|----------------------|------------------|--------------------|---------------|
|-----|----------------------|------------------|--------------------|---------------|

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|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                 |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                             |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Recreation</b>                            | Opportunities for primitive and unconfined recreation, including OHV, camping, big game hunting, and hiking.                                                                                                                                                                                                                                                                                                                                                                                                                      | Values ascribed to recreational experiences of hunting, camping, driving for pleasure or OHV use, as described in terms of individuals' willingness to pay for these activities | Home values impacted by access to primitive and unconfined recreation                                                                                                                                                                                                   | Bequest value: conserving recreational opportunities for future generations to experience. Option value: conserving recreational opportunities for individuals who value the option of being able to visit the unit and who may one day visit the unit.                                     |
| <b>Cultural (Archaeological /Historical)</b> | Undisturbed arch. Sites. Puebloan villages, Pueblo II village, Southern Paiute sites, areas of importance to existing tribes. Rock art, quarries, agricultural features, burial sites, caves, shelters, ancient trails and camps. 7000 to 300 BC hunter gatherer cultures. 300 BC to 1150 AD Pueblo II phase, evidence still exists on monument. Homesteader lifestyles, ranch structures, corrals, water tanks, sawmills, Temple Trail wagon road, old mining sites showing mining history from late 19th to early 20th century. | Value ascribed to cultural experiences and cultural preservation activity, as described in terms of individuals' willingness to pay for these activities                        | Community value of sense of place associated with preservation of cultural heritage                                                                                                                                                                                     | Bequest value: preserving cultural sites for future generations to connect with. Option value: value for individuals to have the option to visit a cultural site at some point in their lives. Existence value: value to individuals for whom the site is important but who may never visit |
| <b>Paleo/Geo</b>                             | Calville limestone in Grand Wash Cliffs has large number of invertebrate fossils,                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value of mineral extraction potential. Value associated with paleontological, archaeological, or geological discoveries                                                         | Values supported by geologic processes such as: 1) Geologic carbon sequestration and storage supporting climate regulation and air quality which generates health and productivity benefits and 2) Replenishment of aquifers and water retention which supports healthy | Option value: value for archaeologists or paleontologists to one day study the unit                                                                                                                                                                                                         |

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|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                                                                                                                                                                                                                      |                                                                                                                                                                                                  | and lower cost water supply                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                            |
| <b>Scientific</b> | Ponderosa pine ecosystem in Mt. Trumbull has been studied for forest structure change, stability of presettlement pine groups, fire history and dendroclimatic reconstruction                                        | Value associated with using resources on the unit as a living laboratory, as opposed to conducting research or educational experiments in an indoor lab                                          |                                                                                                                                                                                                                                                                                                                                       | Option value: value of being able to conduct research on the unit in the future. Bequest value: value for future generations to learn science hands on at the unit                         |
| <b>Water</b>      | Watershed for Colorado River and Grand Canyon in lower Shivwits Plateau, south end contains many important tributaries and rugged and beautiful canyons, riparian corridors aid wildlife movement and seed dispersal | Value of healthy fisheries and healthy water flow for other water based recreation; willingness to pay for these activities. Value of water or watershed as a freshwater source                  | Riparian zones provide:<br>1) Increased nutrient retention and increased vegetative diversity and density 2) Bird and other wildlife habitat and movement corridors 3) Flooding and natural disaster protection. These values provide health benefits to community members, improved crop production and enhanced recreational values | Bequest value: value of maintaining healthy water source and water ecosystem for the benefit of future generations                                                                         |
| <b>Scenic</b>     | Remoteness, undeveloped spaces, on edge of one of most beautiful places on earth, Grand Canyon                                                                                                                       | Portion of home values associated with viewsheds of National Monument, and portion associated with accessibility to low cost outdoor recreation opportunities. Payments in Lieu of Taxes (PILT). | Amenity migration of people seeking quality of life related to scenic views and outdoor recreation opportunities                                                                                                                                                                                                                      | Bequest value: value to future generations of having a "National Conservation Lands" system. Option value: value of being able to experience same scenic views at some point in the future |
| <b>Vegetative</b> | Mojave desert (arid desert) ecosystem, high elevation plateau, river areas, intersection of Sonoran, Mojave, and Great Basin flora, wildlife movement and plant dispersal along river corridor.                      | Values associated with plant, food, or fibers that can be collected. Value of timber harvest potential. Forage                                                                                   | Carbon sequestration and storage, supporting climate regulation and air quality, which generates health and                                                                                                                                                                                                                           | Bequest value: value for future generations to receive the same benefits                                                                                                                   |

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|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | Ponderosa Pine, Giant Mojave Yucca                                                                                                                                                                                                                                | values, as measured in AUMs.                                            | productivity benefits. Erosion prevention and soil health supported by healthy vegetation                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                |
| <b>Wildlife</b> | Mule deer, Kaibab, wild turkey. Threatened and endangered species: Mexican spotted owl, California condor, desert tortoise, southwestern willow flycatcher, goshawk, penstemon distans, Rosa stellata, western mastiff bat, Townsend's big eared bat, spotted bat | Value ascribed to hunting experiences, wildlife viewing and photography | Community values for conserving populations that impact sense of place or community cultural identity, ie conserving the habitat for "charismatic megafauna". Crop pollination services provided by healthy populations of bats and bees. Avoided cost of population control and disease prevention required when natural biological processes do not take place. | Bequest value: value for future generations to be able to see natural habitats and wildlife. Option value: value for an individual to be able to see natural habitats and wildlife at some point. Existence value: value placed on the continued existence of biodiversity not related to visiting the habitat |

Table C5: Metrics for Describing the Economic Value of GCPNM

| ROV                                          | Economic Contributions                                                                                                                                                | Metrics                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Recreation</b>                            | Visitor spending and the associated economic output and jobs supported by this spending. Tax revenues generated from visitor spending.                                | Nonmarket consumer surplus from recreation experiences, estimated by benefit transfer from existing research.<br>Hedonic pricing of home values near the unit that are impacted by access to recreational opportunities                                                                                                                                                               |
| <b>Cultural (Archaeological /Historical)</b> | Visitor spending from visits to cultural sites or hosting cultural events on unit. Spending or job creation from historical or archaeological restoration activities. | Contingent valuation for protecting cultural sites, and willingness to pay for visits to cultural sites                                                                                                                                                                                                                                                                               |
| <b>Paleo/Geo</b>                             | Spending from conferences, field trips/field camps, and other related events that take place on the unit (Contribution)                                               | Using market prices and estimated natural resource abundance to measure the saleable value of mineral resources.<br>Measuring geologic carbon sequestration, applying social cost of carbon to estimate benefits of carbon storage.<br>Drinking water costs in communities that depend on nearby aquifers or aboveground sources that are protected by protecting geologic formations |

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|-------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Scientific</b> | Visitor spending related to science visits and conferences | Quantifying number of journal articles.<br>Number of scientific partnerships with universities or institutions and any money paid by universities or institutions. Using values from Black (1996)                                                                                                                                                                                                                                                                                                                                                                |
| <b>Water</b>      |                                                            | Difference in costs of providing clean drinking water compared to non protected watersheds.<br>Avoided costs of potential flood damage, loss of wildlife habitat                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Scenic</b>     |                                                            | Hedonic pricing of homes within a certain distance or viewshed of a unit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Vegetative</b> |                                                            | Market value of any harvested plant materials.<br>Market value of current levels of livestock grazing                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Wildlife</b>   | Visitor spending from hunting and wildlife viewing.        | Valuing the impact of pollinators on nearby crop productivity.<br>Estimating avoided costs of pest control provided by biodiversity.<br>Valuing willingness to pay for biodiversity, hunting, or wildlife based recreational activities through benefit transfer method or original contingent valuation study.<br>Valuing willingness to pay for protection of threatened and endangered species.<br>Quantifying businesses that are tied to wildlife viewing or number of sites where sense of place or other community values depend on a species or habitat. |